The Salmon and Steelhead Habitat Inventory and Assessment Project

(SSHIAP)

Pilot Basin Assessments

Review Draft

This **DRAFT Report** on the Salmon and Steelhead Habitat Inventory and Assessment Project (SSHIAP) is being circulated to obtain review and comment from SSHIAP cooperators and other interested parties. The report contains the preliminary analyses of four “pilot” watersheds in the project area. Additional data inventory and analyses, including production loss estimates are being conducted on each of these four pilot watersheds, as well as on the remaining watersheds in the area. We welcome any comments and suggestions regarding the form and content of the DRAFT report, as well as on additional or alternative analyses.

Some formatting inconsistencies exist as we’re still debating the best format. Please comment. We apologize for any omissions or inaccuracies in the report. Any such flaws brought to our attention will be corrected in future versions.

Many thanks to the Tribal state, private, and public cooperators who have provided information and suggestions. Keep them coming!!

Please contact the following SSHIAP team members with any questions or comments.

Randy McIntosh
Project Co-Lead
South Sound Area
WRIA’s 11, 13, 14
(360) 438-1181 ext. 369
e-mail: rmcintos@nwifc.wa.gov

Dave Somers
Project Co-Lead
North Sound Area
WRIA’s 1-7
(206) 489-0781
email:dsomers@nwifc.wa.gov

Kim Taylor
Coastal Area Biologist
WRIA’s 20-23
374-5501 Forks
(360) 438-1181 ext. 371 Olympia
e-mail: ktaylor@nwifc.wa.gov

Robin Slate
Mid Sound Area Biologist
WRIA’s 8-10, 12, eastern part of 15
(206) 288-0699 Auburn
(360) 438-1180 Olympia
e-mail: rslate@nwifc.wa.gov

Tom Ostrom
Straits Area Biologist
WRIA’s 18-19, Ozette portion of 20
(360) 297-6540
e-mail: tostrom@nwifc.wa.gov
tostrom@igc.apc.org

Byron Rot
Hood Canal Area Biologist
WRIA’s western 15, 16, 17
(360) 297-6542
e-mail: brot@nwifc.wa.gov

Christy Parker
Assistant
North Sound Area
WRIA’s 1-7
(206) 328-8814
e-mail: cparker@seanet.com

Table of Contents

Introduction

Salmon and steelhead populations throughout the Pacific Northwest have undergone an almost continuous decline during the past century. In response to this crisis, Indian Tribes and the Washington Department of Fish and Wildlife (WDFW) have recently joined forces in the Wild Stock Restoration Initiative (WSRI). In 1992, as part of the WSRI, the state and tribal governments conducted the Salmon and Steelhead Stock Inventory (SASSI). The SASSI process identified distinct spawning populations (stocks) and described their status based upon trends in adult escapement.

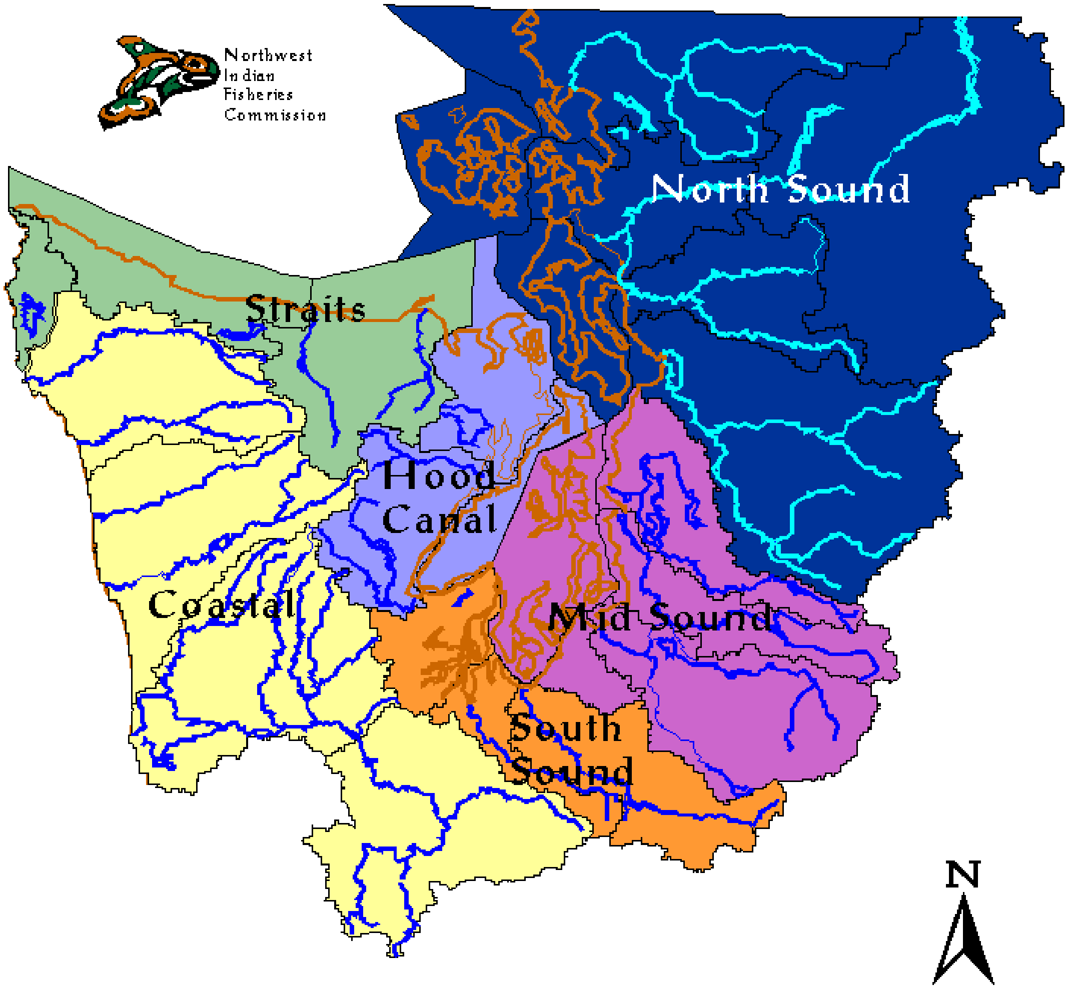
Following SASSI, the next logical step was to document the impact to each SASSI stock from impaired or lost habitat. In order for the State and Tribes to take constructive action to reverse stock declines and achieve recovery, it is critical that the role of habitat loss and impairment in the decline of individual salmon and steelhead populations be well understood and documented.

The Salmon and Steelhead Habitat Inventory and Assessment Project (SSHIAP) was initiated to document current habitat conditions, to assess the effects of habitat degradation and loss on salmon and steelhead stocks, to develop stock or watershed/basin specific strategies for habitat protection and restoration, and to prepare a cooperative strategy to obtain funding to implement the habitat restoration/ protection strategies to fill these needs.

SSHIAP is a two year effort sponsored by the Northwest Indian Fisheries Commission with the cooperation of the Washington Department of Fish and Wildlife. The project area is identical to that used in SASSI, which includes western Washington and excludes the Willapa and Columbia River basins (Figure 1). The project area is divided into five regions, with the focus of habitat assessment on each stock described in SASSI. The purpose of SSHIAP is to provide:

- a counterpart to the evaluation of stock status (SASSI);
- an assessment of the loss and degradation of the quantity and quality of salmon and steelhead habitat;
- necessary information to support state, federal, and tribal efforts to conduct watershed analysis as part of state regulation of forest practices and implementation of the President's Forest Plan;
- information necessary to evaluate and restore impaired water bodies as required under the Clean Water Act;
- a basis for developing basin specific restoration strategies;
- a basis for developing basin and state-wide habitat protection strategies;
- a basis for prioritizing restoration projects;
- a mechanism to guide state, federal, tribal, local, and private restoration activities; and
- the necessary information to integrate habitat strategies with those of harvest management and fish production enhancement programs to allow for overall basin plans which recover salmon and steelhead resources and fisheries.

It is anticipated that many ongoing management efforts will utilize SSHIAP products, including state and federal Watershed Analysis, Habitat Conservation Plans and other Forest Plan efforts, state and federal water quality/water quantity programs, ESA, and many others. SSHIAP should also augment several information systems, including Washington Rivers Information System (WARIS), the Washington Stream Catalog, WDFW's Priority Habitats and Species (PHS) data, 303d lists of impaired water bodies, and others.



Methods

SSHIAP consists of both a data inventory and a habitat assessment. The two project components are being conducted concurrently, with each enhancing but not dependent upon the other.

Inventory

To inventory existing data, we developed a Microsoft ACCESS-based questionnaire that is distributed to tribal and agency personnel within the project area. The purpose of the questionnaire is to document existing data sources, the type of data, the geographic coverage of the data, and data quality.

As the questionnaires are completed, information is collected into a central ACCESS database. In addition, other data sources identified by SSHIAP team members during the assessment portion of our project are also included in the database. The SSHIAP final report will discuss the quantity and quality of existing information, and identify data gaps, inconsistencies, and priority data needs. The inventory database will be made available to tribes and agencies to facilitate future studies and management programs.

Assessment

Salmonids have a complex life history strategy that allows for exposure to a wide variety of natural disturbances and man-made impacts. While salmonids have adapted to a natural disturbance regime, the cumulative effect of human caused disturbances can dramatically affect the survivability of stocks. Characterizing the multitude of human-caused impacts requires a variety of approaches to analyzing habitat data. We have identified three basic categories of impacts to salmonids that we feel are highly important. They are:

- Lost habitat caused by placing streams underground in culverts, filling of channels, or otherwise permanently obliterating the channel
- Obstructed habitat by man-made barriers such as culverts, floodgates and dams
- Degraded habitat due to diking, dredging, channelization, gravel removal, water quality degradation, loss or removal of woody debris, degraded riparian conditions, water withdrawals, and other causes.

Our analysis for each watershed will include these three categories. Time permitting, our assessment may include the following additional analyses over limited areas:

- Estimation of production lost to the catagories outlined above.
- Estimation of the effects of habitat degradation using a full life history model such as Patient Template Analysis (as described by Lichatowich et al. 1995). Patient Template Analysis (PTA) is designed to estimate habitat quality within a watershed relative to life history requirements for each stock.
- Biogeographic analysis to determine the location and type of critical habitats for stocks or sub-stocks, identify known distribution of stocks, and determine gaps in habitat availability, identify production hot-spots, and other key habitat areas. This will allow an assessment of the spatial distribution of stock subpopulations with available habitat. Restoration strategies can then be tailored to habitat and salmonid population distributions within a watershed, and the potential metapopulation dynamics present. This is patterned after the GAP Analysis (Scott et al. 1993) developed for terrestrial resource assessment.

Data Management

Data management is a major component of the SSHIAP project. We have determined that both a relational database and a geographical information system (GIS) are necessary for data compilation, analysis, and the meaningful presentation of results. While much of the existing data regarding habitat quality and quantity can be managed using relational database systems, there is a growing volume of spatial data available that re-quires GIS for efficient and accurate analysis.

We believe that GIS will be an essential component of the habitat inventory and assessment. However, it is also clear that there are several obstacles to GIS implementation, including the significant personnel requirements for implementation, the lack of extensive GIS access by many agency and tribal staff, and the lack of consistent GIS data between watersheds.

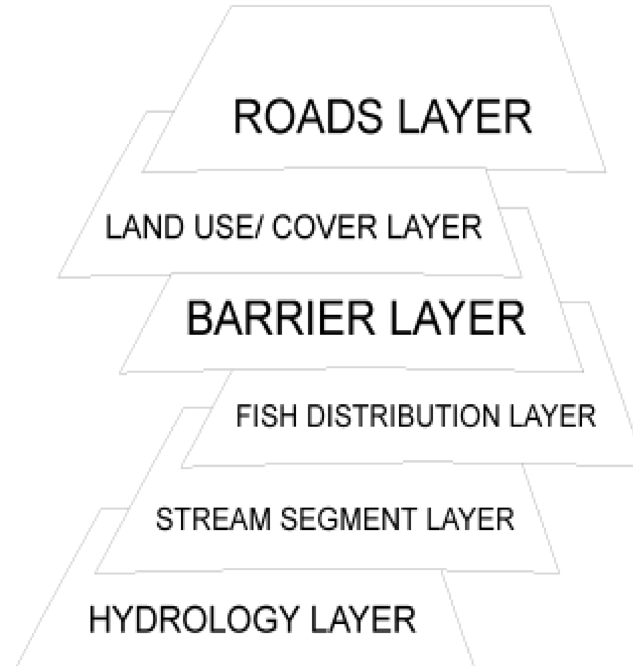
We have designed our data management strategy to focus first on relational database development, but in a manner that will facilitate integration with GIS as our capabilities allow. We have also enlisted team members, agency cooperators, and interns to do preliminary GIS data entry to facilitate linking of relational database information with GIS geographic data, and to establish procedures for accomplishing this linkage.

The SSHIAP team is using ArcView and PC ARCINFO for GIS data management, analysis, and presentation. These GIS tools were selected due to their widespread use by agencies and tribes, the relative widespread availability of geographic data in ARCINFO compatible formats, the relative ease of use of ArcView, and the power of these GIS analysis tools. ARCINFO has become somewhat of an industry standard for GIS, and its use by SSHIAP should help to ensure maximum utility and compatibility with other related projects.

The WDNR Data-96 hydrology data has been identified as the basis for the geographic depiction of streams and rivers. Data-96 hydrology is a compilation of available state and federal 1:24,000 digital data, and is the most comprehensive 1:24,000 data set available for the project area. Existing river information systems, such as the Washington Rivers Information System (WARIS) have used 1:100,000 data. Many smaller streams, side channels, and other relatively small hydrologic features, are not captured at that scale, resulting in an over-simplification of the hydrologic systems and an under-representation of many habitats that are very important to salmon and steelhead. While use of 1:24,000 data will improve our ability to quantify habitat and habitat loss, it also significantly increases the amount of effort required for data inventory and analysis.

One of the GIS related tasks with significant time requirements is the "routing" of hydrological data. In order to overlay information onto a digital hydrology layer and "attach" that information to specific segments of the hydrology, such as a stream segment or reach, the hydrology layer must first be processed to create "route" systems. Route systems are analogous to bus routes - they represent a path from one point to another, such as the mouth of a stream to its headwaters, and allows naming that route with a unique identifier, such as route ARP133. Information that is overlaid on a route can then be given an address, such as R.M. 1.2 on Route ARP133. This allows all information overlaid on a route, or stream system, to be given addresses that can then be compared and related to each other. The location of two features on a stream, such as two culverts, can thus be determined in terms of the distance along the stream between the two culverts. This is a very powerful aspect of GIS, and one that is essential for the analysis of stream networks and the spatial distributions of habitat features. Unfortunately, in order to take advantage of this capability, the streams and rivers within a watershed must first have routes identified and named.

While this process has been completed for 1:100,000 hydrology data throughout Washington, and is used in WARIS, it has not been completed to any significant extent for 1:24,000 hydrology data. The system used to route hydrology data for the WARIS system is being converted for use with 1:24,000 data. This process is, however, proceeding slowly and is essentially being accomplished as a non-



funded work task.

Stream valley segments serve as the basic geomorphic unit for both the relational database and the GIS database. Using TFW methodologies, stream valley segments are identified according to channel gradient and valley confinement using USGS topographic maps, their upper boundaries are marked on map overlays, and each segment is given a unique hierarchical number. This number allows analyses with the relational database. The points marked on map overlays can be entered (digitized) into a GIS, given a unique identifier, and "attached" or related to its associated stream segment in the relational database. Once stream valley segment boundaries have been entered into GIS and associated with the database, all information in the relational database will be accessible for GIS depiction and analysis.

A number of existing GIS data sources have been developed by other agencies, tribes, universities, and private interests. Much of this data is best represented in a map format and will be largely unavailable for detailed use or analysis until the SSHIAP data is linked with GIS hydrology data. Some examples include a map of historic vegetation for Western Washington developed by Robert VanPelt at the University of Washington, a land cover GIS database developed by the National Biological Service (NBS) for the Washington GAP analysis, a map of existing riparian vegetation stand type developed by the USEPA using NBS data, and maps of geology, soils, precipitation, topography, and political boundaries. All of these data are in GIS format and lend themselves best to GIS data management, analysis, and presentation.

Work Completed to Date

With the able assistance of many interns, tribal biologists, state agency staff and others, the SSHIAP team has accomplished much during its first year. Approximately 60% of the watersheds have been segmented and many of these have been digitized. Most pertinent GIS layers have been identified and, where possible, gathered for our use. Much work has been done to solicit assistance, cooperation and partnerships among and between those engaged in similar efforts.

During the first 15 months of the project, the SSHIAP team has:

- Developed and tested methods (ongoing)
- Developed and distributed inventory questionnaire (ongoing)
- Developed and tested database (ongoing)
- Collected data for pilot and other watersheds (ongoing)
- Conducted pilot watershed assessments
- Developed GIS capabilities and integration strategy (ongoing)
- Created preliminary GIS products (ongoing)
- Entered estuary GIS layer (Bortleson et. al. 1980)

Workplan for Year Two

- Coordinate with Tribes and agencies on pilot Assessments and other project components
- Continue data collection and analysis on pilot and non-pilot watersheds with and emphasis on habitat loss/habitat degrada tion methods
- Develop and apply salmonid production loss estimation methods
- Continue development of GIS capabilities and integration strategy
- Collect and summarize inventory data
- Seek and establish alternate additional funding sources
- Develop sound wild stock protection and restoration strategies

Conclusion

SSHIAP will provide an inventory and assessment of existing data regarding salmon and steelhead habitat quantity and quality in Western Washington. Results of the assessment will provide basic information regarding salmonid habitat for use in restoration planning, habitat management, and stock management. The information base, and associated database and GIS system, can provide the basic body of information and data management tools for a comprehensive habitat information system. Such a system is key to the successful management of wild salmon and steelhead stocks and their essential habitats, and will provide basic region-wide habitat data for future analysis of the relationships between freshwater habitat and stock status and production.

REFERENCES

Beechie, T., E. Beamer and L. Wasserman. 1994. Estimating coho salmon rearing habitat and smolt production losses in a large river basin, and implications for habitat restoration. North American Journal of Fisheries Management 14:797-811.

Bortleson, G.C., M.J. Chrastowski, and A.K. Helgerson. 1980. Historical changes of shoreline and wetland at eleven major deltas in the Puget Sound region, Washington. U.S. Geological Survey Atlas HA-617.

Botkin, D., K. Cummins, T. Dunne, H. Regier, M. Sobel, and L. Talbot. 1994. Status and future of salmon of western Oregon and northern California: findings and options. The Center for the Environment, Santa Barbara, California.

Montgomery, D.R. and J.M. Buffington. 1993. Channel classification, prediction of channel response, and assessment of channel condition. Washington Department of Natural Resources, Olympia, Washington. Report TFW-SH10-93-002.

Lichatowich, J., L. Mobrand, L. Lestelle, and T. Vogel. 1995. An approach to the diagnosis and treatment of depleted Pacific salmon populations in Pacific Northwest watersheds. Fisheries 20(1):10-18.

Orsborn, J. F. 1990. Quantititative modeling of the relationships among basin, channel and habitat characteristics for classification and impact assessment. Timber, Fish and Wildlife program, Washington Department of Natural Resources, Olympia, Washington TFW-AM3-90-010.

Scott, J. M., F. Davis, B. Csuti, R. Noss, B. Butterfield, C. Groves, H. Anderson, S. Caicco, D. D'Erchia, T. C. Edwards Jr., J. Ulliman and R. G. Wright. 1993. Gap analysis: A geographic approach to protection of biological diversity. Wildlife Monographs 123:1-41.